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extension greater than that of the other two terms ; and finally, in the third figure, the middle term itself has the least extension of all the terms. But this tabulation will serve at the same time to disclose the principles underlying the classification which led to the division of syllogisms into the three figures : *it is the relation as regards extension in which the middle term stands to the other terms.*"

This explanation, which may now be fairly said to be established, receives striking confirmation from the apt interpretation given by Dr. Maier of the meaning of the so-called *θέσις* of the terms in the three figures. He shows (pp. 53, ff.) that it refers to the order of the letters of the alphabet which are conventionally used by Aristotle in three groups, $A-B-\Gamma$, for the first figure ; $M-N-\Xi$, for the second ; $\Pi-P-\Sigma$, for the third. Thus, then, in accordance with this scheme for the first figure, the middle term, B, will also regularly occupy the middle place in the order of occurrence as the terms appear in the series presented by the schematized syllogism.

With this notice we may now content ourselves. The typography of the book is rather unusually good. A very few errors of consequence appear, two of which may be noted. On p. 37, line 6, '*nicht*' seems to have fallen out before "*völlig*," and, on p. 114, note 2, announced in the text, does not appear at the foot of the page. In conclusion we may say, what really need not be said after the favorable words already spoken, that Dr. Maier has undoubtedly given us the best book on the subject of Aristotle's logic.

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The Sphere of Science. By FRANK SARGENT HOFFMAN, Ph. D., Professor of Philosophy in Union College. New York and London, G. P. Putnam's Sons, 1898.—pp. viii, 268.

In his preface Professor Hoffman states that the object of his book is "to point out with clearness what it is that constitutes a science, and to set forth with some detail what are the grounds upon which every science rests, and what are the principles and rules that must be followed in order to construct one. It is maintained from the first chapter to the last that every department of knowledge is capable of scientific treatment, and must be so treated before any great advance can be made towards a consistent and rational conception of the universe." He also states that the book is "the outcome of a series of lectures given to my classes in Union College to supplement their work in Formal Logic." The general character of the book would lead us to estimate it as such a supplement.

What constitutes a science is outlined in the first chapter. A science involves (1) a knowledge of facts, (2) that these facts be capable of verification, (3) that the knowledge of them be classified, and (4) that they be put together in a system. These constituents yield the following definition:

"Science, therefore, may be properly defined as logically arranged and systematized knowledge, or more fully, that kind of knowledge which consists of facts carefully ascertained, accurately verified, and logically put together into a system" (p. 7). From this definition the conclusion is drawn that it is illogical to limit science to any particular class of facts, to the exclusion of other classes which conform to the definition. Science is then distinguished from art by the old dictum—"A science teaches us to know, an art to do"; from literature, which is the ornament of science and the means of its communication; and from philosophy, which is the "Science of the sciences," that which unifies the sciences into one system. Science is not divorced from faith, since "gravitation, motion, force, atom, ether, and the like are the veritable products of faith, and in no sense matters of absolute knowledge" (p. 12). Completeness or freedom from error is not essential to science, for science is progressive. But this does not destroy its value, for by progressing it is constantly enlarging the nucleus of certainty contained in previous scientific progress.

This conception of science is the traditional one developed in works on Formal Logic, and shares in the inadequacies of such a conception. While the worker in science may undoubtedly conform to the conditions noted by Professor Hoffman, he does more. His conception is wider and more fundamental than that here outlined. He may exhibit the results of his work as a system of verifiable facts logically arranged and classified, but such an exhibition can hardly be regarded as his purpose. It serves rather simply as a logical or rhetorical device for a clear presentation of his discoveries. His purpose is other than rhetorical, it is to ascertain the fundamental structure of the elements with which he deals, and the invariable ways in which these elements act and interplay. It is by no means clear that this purpose will be secured simply by logically arranging and classifying verifiable facts into a system, unless we give to the terms 'logically' and 'system' a far wider meaning than is given to them in works on formal logic. The traditional doctrine of 'division' presents verifiable facts logically arranged and classified into a system, but it does not present a science, because it does not present a fundamental structure of elements and the invariable modes of their action and interplay.

Nor does Professor Hoffman's chapter on "The Scientific Method" remedy the defects in his conception of science, even if it does insist on the inductive methods as essential to the discovery of causal connections. For the chapter presents these methods simply as among the traditional standards of perfection by which any hypothesis is to be estimated, but does not make clear the essential character of a scientific hypothesis; namely, that it is the assumption of elementary structures and activities which are exemplified in very complex processes, and in the light of which these processes may consequently be simplified and explained. In short, the fundamental inadequacy of the conception of science here outlined seems to lie in the apparent identification of the machinery used in the

discovery and exposition of scientific results, with the character of those results. Science is indeed a system of verifiable facts logically arranged and classified, and discovered by certain methods, but it is also something more; namely the discovery how complex processes are but the exemplification of the natural interaction of elementary structures not further reducible, and it is this something more that distinguishes it as science.

Exception ought also to be taken to Professor Hoffman's conception of philosophy as the unification of the sciences, for philosophy does something else than unify science. While like science it deals with reality, and thus may be said to have the same subject matter as science, its purpose is different. It does not, like science, seek to resolve complex processes or their sum into previously known or supposed simple elements and their activities, it seeks rather to formulate a conception of reality itself. It asks not *how* is the universe in all its complexity to be explained, but *what* in all its complexity is it. Thus while it is true, as Professor Hoffman asserts, that "every department of knowledge is capable of scientific treatment," such treatment does not exhaust reality. Reality itself is more than any scientific explanation can reveal, and it is this 'more' which philosophy tries to make evident and appreciable. Every great system of philosophy is evidence of this, and this is the mark of the idealistic philosophies in particular; for their great merit is just the insistence that the completest scientific explanation can never be made a substitute for reality, or for a philosophy of reality.

Professor Hoffman gives the following as the presuppositions of science in the chapter entitled "What Science Takes for Granted": (1) the scientist's knowledge of his own existence, so that he can separate himself from his sensations and contemplate them in order to form general notions; (2) a similar knowledge of self he must allow to all his fellows in order to insure communication; (3) the existence and validity of the laws of thought; (4) the rational construction of the universe, which involves (*a*) that all objects of science are related as substance and attribute, (*b*) that every beginning or change of existence in the universe has a cause, (*c*) that the universe exists in space and time, (*d*) that the universe is regulated and controlled by design, (*e*) that the universe is constructed so as to be consistent with itself; (5) that the human mind is, in some respects at least, a reflex of the divine; and finally, (6) that the realm of science is coincident with the realm of reflective thought. This seems much like saying that science takes for granted the whole of the Cartesian philosophy. While scientific investigations may involve some of these presuppositions when epistemologically considered, it can hardly be claimed that the success of science depends on even their tacit presupposition, and least of all that the authority of science rests on such a set of ulterior truths (p. 39).

The certainty possible for science is expressed as follows: "The conclusion of the whole matter is this, that it is never necessary, in fact that it is never possible, to do more for any doctrine, in any department of inquiry,

than to show that the balance of probabilities is in its favor. When we have shown that, we have made the doctrine worthy of credence, we are entirely justified in accepting it as truth and adopting it as a rule of conduct" (p. 80).

The remaining chapters of the book are detailed illustrations of the positions already sketched. As a whole the book is not timely. It proceeds with apparent disregard of modern epistemology, and contains no thorough analysis of the foundations of science.

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La cause première d'après les données expérimentales. Par ÉMILE FERRIÈRE. Paris, Félix Alcan, 1899.—pp. 462.

This volume is the last of a series of three designed "to demonstrate the unity of substance by means of positive facts to the exclusion of all *a priori* argument." The first volume of the series was entitled *La matière et l'énergie*, the second *La vie et l'âme*. The first book of this volume gives a *résumé* of the contents of the two earlier works, the outcome of which is that the soul is the function of the brain. It is not a simple unity but a resultant. Just as white light, so apparently simple, is shown by the prism to be the resultant of seven colors, so the unity of the soul is shown by facts both normal and pathological to be a resultant. The soul of man is of the same nature as that of the animal. The difference is only one of degree. Matter and energy alone, however, do not account for the phenomena of life. The theory of evolution suffices to reduce derived forms to anterior types. Science is silent as to these original types. "It follows that the existence of form implies the existence of a first cause." And again, since science shows that all life comes from the germ, "it follows that the origin of life on the terrestrial globe implies the existence of a first cause" (p. 86). Biology has disproved spontaneous generation. Chemistry has disproved the existence of vital forces, and cerebral physiology the existence of individual souls as physical substances. The terms of the metaphysical problem therefore are reduced to a first cause and matter-energy. The problem is how are these two related.

Book second on "Final Causes" maintains that there is a plan and directing idea at the origin of primordial types, but no finality is manifested in the relations of the several groups of beings to one another. "The egg of the hen is not made to serve as food for man, but to produce a hen." Each being has its finality in itself, not outside of itself. There is "internal finality" but no "external finality." Books third and fourth take up more than half the volume, and discuss the plan of the creation of the animal kingdom and vegetable kingdom respectively. The outcome of this discussion is that the theory of gradual perfection is proved false by the facts. Such facts as the late appearance of lower forms, the existence of parasites which must